

1. Work requester fills out this section.

☐ Standing Work Permit

Requester: Don Lynch	7/15/2011	Ext.: 2253	Dept/Div/Group: PO/PHENIX
Other Contact person (if different from requester): Carter Biggs			Ext.: 7515
Work Control Coordinator: Don Lynch		Start Date: 7/18/11	Est. End Date: 7/29/11
Brief Description of Work: Install RPC Prototype PE & Pb Absorbers & RPC! Prototype Detector			
Building: 1008	Room: IR	Equipment: Prototype RPC1 and PE & Pb Absorbers	Service Provider: PHENIX techs

WCC, Requester/Designee, Service Provider, and ES&H (as necessary) fill out this section or attach analysis

ES&H ANALYSIS				
Radiation Concerns	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Activation	<input type="checkbox"/> Airborne	<input type="checkbox"/> Contamination <input checked="" type="checkbox"/> Radiation
Radiation Generating Devices:	<input type="checkbox"/> Radiography	<input type="checkbox"/> Moisture Density Gauges	<input type="checkbox"/> Soil Density Gauges	<input type="checkbox"/> X-ray Equipment
<input type="checkbox"/> Special nuclear materials involved, notify Isotope Special Materials Group			<input type="checkbox"/> Fissionable materials involved, notify Laboratory Criticality Officer	
Safety Concerns	<input type="checkbox"/> None	<input type="checkbox"/> Ergonomics	<input type="checkbox"/> Transport of Haz/Rad Material	
<input type="checkbox"/> Adding/Removing Walls or Roofs	<input type="checkbox"/> Confined Space*	<input type="checkbox"/> Explosives	<input checked="" type="checkbox"/> Lead*	<input type="checkbox"/> Penetrating Fire Walls
	<input type="checkbox"/> Corrosive	<input type="checkbox"/> Flammable	<input type="checkbox"/> Magnetic Field*	<input type="checkbox"/> Pressurized Systems
<input type="checkbox"/> Asbestos*	<input type="checkbox"/> Cryogenic	<input type="checkbox"/> Fumes/Mist/Dust*	<input checked="" type="checkbox"/> Material Handling	<input checked="" type="checkbox"/> Rigging/Critical Lift
<input type="checkbox"/> Beryllium*	<input type="checkbox"/> Electrical	<input type="checkbox"/> Heat/Cold Stress	<input type="checkbox"/> Noise*	<input type="checkbox"/> Toxic Materials*
<input type="checkbox"/> Biohazard*	<input checked="" type="checkbox"/> Elevated Work*	<input type="checkbox"/> Hydraulic	<input type="checkbox"/> Non-ionizing Radiation*	<input type="checkbox"/> Vacuum
<input type="checkbox"/> Chemicals*	<input type="checkbox"/> Excavation	<input type="checkbox"/> Lasers*	<input type="checkbox"/> Oxygen Deficiency*	<input type="checkbox"/> Other
* Does this work require medical clearance or surveillance from the Occupational Medicine Clinic? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Environmental Concerns	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Work impacts Environmental Permit No.		
<input type="checkbox"/> Atmospheric Discharges (rad/non-rad)	<input type="checkbox"/> Land Use	<input type="checkbox"/> Soil Activation/contamination	<input type="checkbox"/> Waste-Mixed	
<input type="checkbox"/> Chemical or Rad Material Storage or Use	<input type="checkbox"/> Liquid Discharges	<input type="checkbox"/> Waste-Clean	<input type="checkbox"/> Waste-Radioactive	
<input type="checkbox"/> Cesspools (UIC)	<input type="checkbox"/> Oil/PCB Management	<input type="checkbox"/> Waste-Hazardous	<input type="checkbox"/> Waste-Regulated Medical	
<input type="checkbox"/> High water/power consumption	<input type="checkbox"/> Spill potential	<input type="checkbox"/> Waste-Industrial	<input type="checkbox"/> Underground Duct/Piping	
Waste disposition by:			<input type="checkbox"/> Other	
Pollution Prevention (P2)/Waste Minimization Opportunity:	<input checked="" type="checkbox"/> None <input type="checkbox"/> Yes			
FACILITY CONCERNS	<input checked="" type="checkbox"/> None			
<input type="checkbox"/> Access/Egress Limitations	<input type="checkbox"/> Electrical Noise	<input type="checkbox"/> Potential to Cause a False Alarm	<input type="checkbox"/> Vibrations	
	<input type="checkbox"/> Impacts Facility Use Agreement	<input type="checkbox"/> Temperature Change	<input type="checkbox"/> Other	
<input type="checkbox"/> Configuration Control	<input type="checkbox"/> Maintenance Work on Ventilation Systems	<input type="checkbox"/> Utility Interruptions		
WORK CONTROLS				
Work Practices				
<input type="checkbox"/> None	<input type="checkbox"/> Exhaust Ventilation	<input checked="" type="checkbox"/> Lockout/Tagout	<input type="checkbox"/> Spill Containment	<input type="checkbox"/> Security (see Instruction Sheet)
<input checked="" type="checkbox"/> Back-up Person/Watch	<input type="checkbox"/> HP Coverage	<input type="checkbox"/> Posting/Warning Signs	<input type="checkbox"/> Time Limitation	<input type="checkbox"/> Other
<input type="checkbox"/> Barricades	<input type="checkbox"/> IH Survey	<input type="checkbox"/> Scaffolding-requires inspection	<input type="checkbox"/> Warning Alarm (i.e. "high level")	
Protective Equipment				
<input type="checkbox"/> None	<input type="checkbox"/> Ear Plugs	<input type="checkbox"/> Gloves	<input type="checkbox"/> Lab Coat	<input checked="" type="checkbox"/> Safety Glasses
<input type="checkbox"/> Coveralls	<input type="checkbox"/> Ear Muffs	<input type="checkbox"/> Goggles	<input type="checkbox"/> Respirator	<input checked="" type="checkbox"/> Safety Harness
<input type="checkbox"/> Disposable Clothing	<input type="checkbox"/> Face Shield	<input checked="" type="checkbox"/> Hard Hat	<input type="checkbox"/> Shoe Covers	<input checked="" type="checkbox"/> Safety Shoes <input type="checkbox"/> Other
Permits Required (Permits must be valid when job is scheduled.)				
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Cutting/Welding	<input type="checkbox"/> Impair Fire Protection Systems		
<input type="checkbox"/> Concrete/Masonry Penetration	<input type="checkbox"/> Digging/Core Drilling	<input type="checkbox"/> Rad Work Permit-RWP No		
<input type="checkbox"/> Confined Space Entry	<input type="checkbox"/> Electrical Working Hot	<input type="checkbox"/> Other		
Dosimetry/Monitoring				
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Heat Stress Monitor	<input type="checkbox"/> Real Time Monitor	<input type="checkbox"/> TLD	
<input type="checkbox"/> Air Effluent	<input type="checkbox"/> Noise Survey/Dosimeter	<input type="checkbox"/> Self-reading Pencil Dosimeter	<input type="checkbox"/> Waste Characterization	
<input type="checkbox"/> Ground Water	<input type="checkbox"/> O ₂ /Combustible Gas	<input type="checkbox"/> Self-reading Digital Dosimeter	<input type="checkbox"/> Other Check O ₂ level prior to entry	
<input type="checkbox"/> Liquid Effluent	<input type="checkbox"/> Passive Vapor Monitor	<input type="checkbox"/> Sorbent Tube/Filter Pump		
Training Requirements (List below specific training requirements)				
CA -Collider User, PHENIX Awareness, Working at heights, rigging				
Based on analysis above, the Walkdown Team determines the risk, complexity, and coordination ratings below:			If using the permit when all hazard ratings are low, only the following need to sign: (Although allowed, there is no need to use back of form)	
ES&H Risk Level:	<input type="checkbox"/> Low	<input checked="" type="checkbox"/> Moderate	<input type="checkbox"/> High	WCC: _____ Date: _____
Complexity Level:	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High	Service Provider: _____ Date: _____
Work Coordination:	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High	Authorization to start _____ Date: _____
(Departmental Sup/WCC/Designee)				

3. Both work requester and service provider contribute to work plan (use attachments for detailed plans)

Work Plan (procedures, timing, equipment, and personnel availability need to be addressed): The tasks described in this WP are part of the overall efforts related to the new RPC detector in which several detector and absorber stations have already been installed during the current and previous year maintenance shutdowns (RPC3N and RPC3S and the north and south stainless absorbers) and this year's maintenance shutdown (RPC1N and RPC1S). These efforts have been, or will be, planned and described in other enhanced work permits. This permit and the attached procedure/plan are applicable only to the removal of prototype installations of absorbers and detectors described herein.				
Special Working Conditions Required: None				
Operational Limits Imposed:				
Post Work Testing Required: No				
Job Safety Analysis Required: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			Walkdown Required: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Reviewed by: Primary Reviewer will determine the size of the review team and the other signatures required based on hazards and job complexity. Primary Reviewer signature means that the hazards and risks that could impact ES&H have been identified and will be controlled according to BNL requirements.				
Title	Name (print)	Signature	Life #	Date
Primary Reviewer				
ES&H Professional				
Other				
Other				
Work Control Coordinator	Don Lynch		20146	
Service Provider				
	Review Done: <input type="checkbox"/> in series <input type="checkbox"/> team			

4. Job site personnel fill out this section.

Note: Signature indicates personnel performing work have read and understand the hazards and permit requirements (including any attachments).			
Job Supervisor:		Contractor Supervisor:	
Workers:	Life#:	Workers :	Life#:
Workers are encouraged to provide feedback on ES&H concerns or on ideas for improved job work flow. Use feedback form or space below.			

5. Departmental Job Supervisor, Work Control Coordinator/Designee

Conditions are appropriate to start work: (Permit has been reviewed, work controls are in place and site is ready for job.)			
Name:	Signature:	Life#:	Date:

6. Departmental Job Supervisor, Work Requester/Designee determines if Post Job Review is required. ☐ Yes ☐ No

Post Job Review (Fill in names of reviewers)			
Name:	Signature:	Life#:	Date:
Name:	Signature:	Life#:	Date:

7. Worker provides feedback.

Worker Feedback (use attached sheets as necessary)	
a) WCM/WCC: Is any feedback required? <input type="checkbox"/> Yes <input type="checkbox"/> No	
b) Workers: Are there better methods or safer ways to perform this job in the future? <input type="checkbox"/> Yes <input type="checkbox"/> No	

8. Closeout: Work Control Coordinator (authorizing dept.) checks quality of completed permit and ensures the work site is left in an acceptable condition. (WCC can delegate clean up of work area to work supervisor)

Name:	Signature:	Life#:	Date:
Comments:			

Removal of RPC Prototype Polyethylene and Lead Absorbers and RPC1 Prototype Detector in the South "Flowerpot" Cavity of the PHENIX Central Magnet

Introduction

During the summer 2010 shutdown maintenance period PHENIX technicians installed nearly 20 tons of stainless steel in the "flowerpot" cavities on the north and south sides of the PHENIX Central Magnet (CM). These absorbers are made of 310 Stainless Steel, chosen for its low permeability and resistance to permeability changes due to thermal and mechanical fabrication processes.

Analyses indicated that these absorbers will generate secondary background radiation that may be absorbed by additional layers of borated polyethylene and lead. Prototypes were fabricated by the RPC group and were installed near the end of the 2010 maintenance shutdown. These prototypes were intended to shield the upper half of the south direction of PHENIX. The effectiveness of these absorbers was evaluated, and if successful, the full 360 degrees, north and south cavities was to be outfitted with a final design of the borated polyethylene and lead absorber. Unfortunately the tests proved unsuccessful for the borated poly/lead absorbers, but quite effective for the steel absorbers, and as a result the prototype absorbers will be removed, the full steel absorbers will remain and the RPC1 detector subsystem will be installed without additional poly/lead.

In addition, the RPC group assembled a prototype octant of the proposed future RPC1 detector. This prototype was installed in the southeast quadrant of the CM south flowerpot external cavity, with its lower edge rotated 30 degrees up from vertical. The following illustrations demonstrate the methods and fixtures that were utilized to install these prototypes.

I. Design

The absorber design requirements called for 2.5 cm (actual thickness = 1 inch) of borated polyethylene and 1 cm (actual thickness = 3/8 inch) of lead to be attached to the north and south outer sides of the PHENIX Central Magnet (CM) central poles in the conical cavities surrounding the PHENIX Beam-Beam Counter (BBC) subsystem and attached to the existing 36 cm of stainless steel type 310 previously installed. The BBC's are housed in lead enclosures commonly referred to as the north and south "flower pots" (due to their shapes). The shape of the cavity is a frustum (truncated cone) within a frustum, the outer frustum formed by the inner walls of the cavity and the inner frustum by the flower pot, both frustums decreasing in diameter at the ends closest to the PHENIX IP. There was 1 prototype quadrant installed in the south upper 2 quadrants attached to the existing stainless steel absorbers using 4 existing tapped holes in the stainless absorbers that had been used to attach to the absorber installation fixture.

The prototype absorbers were designed to match the outer dimensions of the outermost layer of stainless absorber and mounting holes matching the 4 tapped holes on the stainless absorbers. The prototypes were fabricated with matching holes to allow the borated polyethylene and lead components to be bolted together using captive bolts and installed as 2 single assemblies. There are also 2 additional matching holes to accommodate a captive bolt for lifting with the PHENIX IR Crane. These 2 holes are located at the CG's for the east and west installed orientations. The borated polyethylene absorbers weigh approximately 57 lbs while the lead absorbers weigh 215 lbs, for an assembled installed weight of approximately 272 lbs. Although this is much lighter than the stainless absorbers it is much too heavy to be installed by hand and thus requires the PHENIX IR Crane.

In addition, an installation guide system was designed and constructed from customized unistrut components and fabricated connectors to guide the absorbers into their installed position, while preventing the assembly from contacting or even overhanging any unprotected section of the beampipe at any time during installation.

The prototype detector is smaller (octant) and lighter (37 lbs) and was mounted under the flowerpot and under the height of the beampipe. The detector was installed by hand onto a fabricated 1/4 inch thick aluminum support structure (support structure weight is approximately 16 lbs) with 4 integral mounting bolts which align with mounting holes designed into the prototype detector. The support structure was mounted to the outermost stainless absorber in the southeast quadrant of the flowerpot cavity using 4 bolts into the existing lifting fixture tapped holes on the stainless absorber.

II. Fabrication

Fabrication of the absorbers was placed with an outside VENDOR thru the University of Illinois, Urbana.. Mounting hardware, mounting fixtures, and prototype detector support structure was fabricated by BNL Central Shops (custom parts), purchased by PHENIX technical staff (off-the-shelf hardware and unistrut components), with minor modifications and assembly by PHENIX technicians as appropriate and in accordance with BNL contractual requirements, etc.

III. Prototype electronics support systems and gas system components .

In support of the RPC1 prototype PHENIX technicians installed a rack on the PHENIX CM bridge platform, route cables, fibers and gas piping in accordance with accepted BNL practices as worker planned work both before and during RHIC run 11. The components used and details of these efforts were reviewed with CAD ESRC as necessary and appropriate. This rack will remain in its current location and serve as one of 2 racks supporting the new RPC1 detector subsystem to be installed later during the current shutdown. (Note: the RPC1 installation shall be covered by a separate work permit.)

IV. Procedure

This work is to be done by fully trained and experienced personnel (PHENIX mechanical technicians) during the 2011 maintenance shutdown prior to RHIC run 12.

(Please see the Borated Polyethylene and Lead Absorber Prototypes and RPC1 Prototype Illustrated Installation Plan for more detailed descriptions of the installation currently in place. This is available with the 2010 Work Permit under which these prototypes were installed.)

A. Prior to Removal:

1. Read and understand all components of the work permit and attachments for this installation effort.
2. Cover the exposed section of beampipe south of the CM southside flowerpot with thick foam insulation.
3. Pre-assemble and install the prototype RPC1 mounting fixture onto the lower southeast quadrant of the RPC stainless absorber.

B. Prototype Absorber Removal

The RPC prototype PE & Pb absorber is installed in 2 quadrants on the upper east and upper west outermost stainless steel RPC absorber quadrants. Removal requires 3 persons, 1 to operate the crane from the ground level and 2 in a manlift adjacent to the installation location.

1. Attach all of the installation guide fixture components and hardware to the prototype borated poly/lead absorber and make sure that the fixture is positioned to take the load of the absorber when unbolted without excessive swaying or otherwise unsafe motion. Make sure the safety stop bolt is installed to prevent the trolley from traveling out of the guide track
2. Carefully unbolt 4 M14 bolts attaching the prototype absorber from the adjacent stainless absorber.
3. Roll the trolley from the absorber installation position rotating the prototype absorber as necessary to position it under the limit of crane coverage.
4. Position the 1 ton IR west crane directly overhead and connect the crane hook to the borated poly/lead absorber using conventional rigging rated for 500 lbs or more.
5. Raise the crane until the load is transferred from the fixture trolley to the crane.

6. Remove the safety stop bolt which prevents the trolley from traveling out of the guide track.
7. Using the IR west 1 ton crane, lift the prototype assembly from technicians in the manlift and transport the prototype away from its installed position to the 12 ton crate in the IR for final disposition by the RPC experts. Make sure the load does not traverse over any unprotected section of the beampipe during this step.

RPC1 Prototype Detector Removal

1. Using the manlift remove all RPC1 prototype cables fluid lines.
2. Carefully loop and tie up all excess cable on the face of the prototype detector using cable ties or similar.
3. While one technician holds the prototype, disconnect the 4 attaching bolts then carefully demount the prototype. And put it on the floor of the manlift.
4. Similarly demount the mounting fixture plate from the outermost steel absorber plates and place the fixture plate on the floor of the manlift.
5. Using the manlift, transport the prototype detector and installation plate to the IR floor for final disposition by the RPC experts.

V. Work conclusion

When all work described in this work permit has been completed, the PHENIX work coordinator for this set of tasks shall collect feedback from all parties (PHENIX engineers and technicians and RPC experts).